

Wild Rice Study - Hydroponic Tests  
Summary of dose response analysis to date  
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2/18/2014

### **Analysis description**

Data from 3 hydroponic tests (Range Finder, Definitive 1, and Definitive 2) were independently fit to a 4-parameter logistic model using R software. These analyses use growth change as the response variable, which provides a better indication of whole-plant change in growth (compared to length change) and does not assume exponential growth was occurring (growth rate constant makes this assumption). Two independent variables are investigated: 1) log(mean sulfide) and 2) log(mean initial sulfide).

### **General 4-Parameter Logistic Model**

- $y = A + (B-A)/(1+e^{-(C-x)/D})$
- A = left-side horizontal asymptote (max response)
- B = right-side horizontal asymptote (min response)
- C = x value at the inflection point of the curve.
- D = slope parameter, indicating the speed with which the curve rises between min and max responses.

### **EC50 and EC20**

- EC20\* and EC50\* are calculated for positive values of y. EC20\* = 0.8A. EC50\* = 0.5A.
- EC50\* is a more statistically robust estimate than EC20\*.
- Additional work is required to calculate the error around these estimates.

**Model 1****Data set = Range Finder****Y = weight change****X = log(mean sulfide concentration)**

Formula: weight\_change\_mgd.1 ~ SSfpl(log\_meansulfide\_ugL, a, b, c, d)

Parameters:

Estimate	Std. Error	t value	Pr(> t )
a 0.49692	0.03914	12.696	6.50e-08 ***
b -0.10906	0.08163	-1.336	0.2085
c 2.55198	0.15504	16.460	4.27e-09 ***
d 0.32791	0.11407	2.875	0.0151 *

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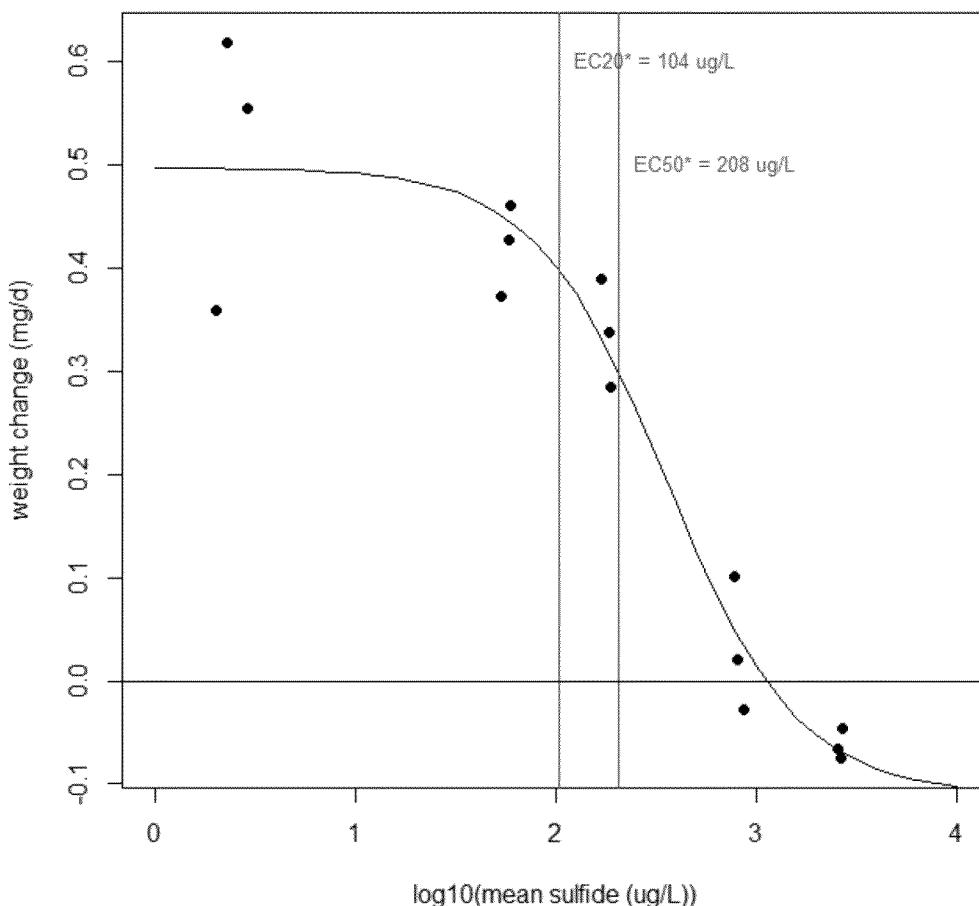
Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 '' 1

Residual standard error: 0.0712 on 11 degrees of freedom

Number of iterations to convergence: 0

Achieved convergence tolerance: 5.048e-06

### Range Finder



**Model 2****Data set = Definitive 1****Y = weight change****X = log(mean sulfide concentration)**

Formula: weight\_change\_mgd.1 ~ SSfpl(log\_meansulfide\_ugL, a, b, c, d)

Parameters:

Estimate	Std. Error	t value	Pr(> t )
a 0.43796	0.05032	8.704	2.90e-06 ***
b -0.26621	0.14325	-1.858	0.0901.
c 2.48534	0.18674	13.309	3.99e-08 ***
d 0.29275	0.11990	2.442	0.0327 *

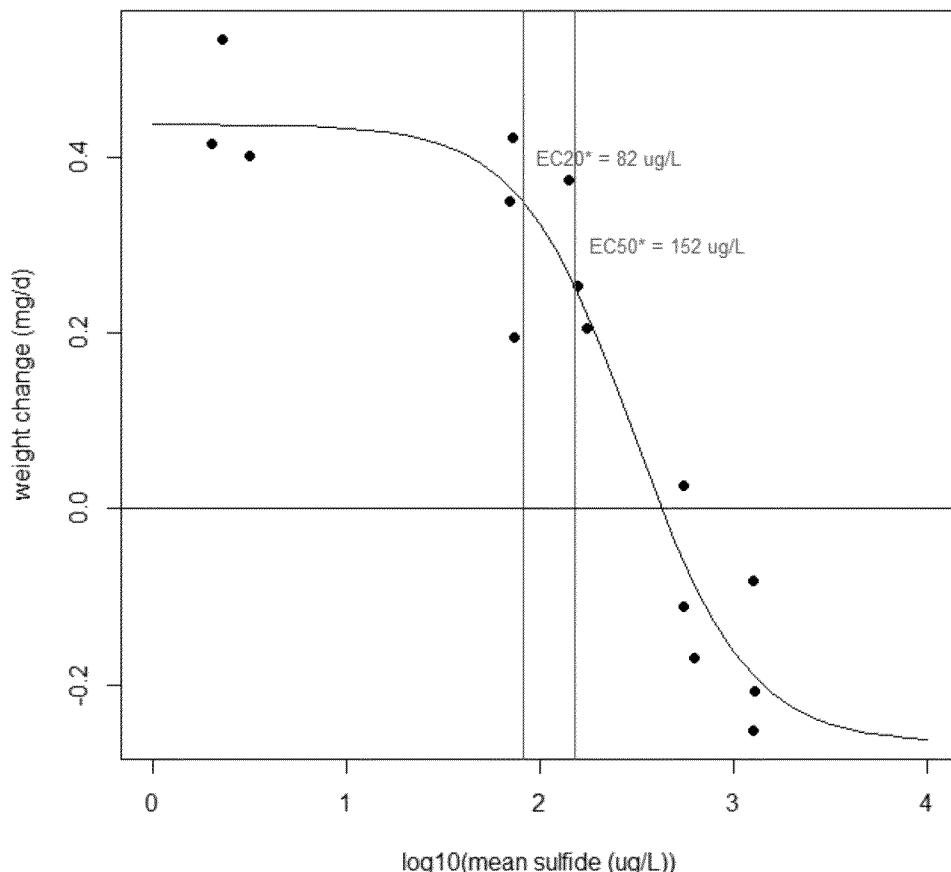
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Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 '' 1

Residual standard error: 0.08906 on 11 degrees of freedom

Number of iterations to convergence: 0

Achieved convergence tolerance: 4.934e-06

**Definitive 1**

**Model 3****Data set = Definitive 2****Y = weight change****X = log(mean sulfide concentration)**

Formula: weight\_change\_mgd.1 ~ SSfpl(log\_meansulfide\_ugL, a, b, c, d)

Parameters:

Estimate	Std. Error	t value	Pr(> t )
a 0.26964	0.02459	10.966	2.92e-07 ***
b -0.03783	0.02685	-1.409	0.1865
c 2.32803	0.76367	3.048	0.0111 *
d 0.05737	0.35484	0.162	0.8745

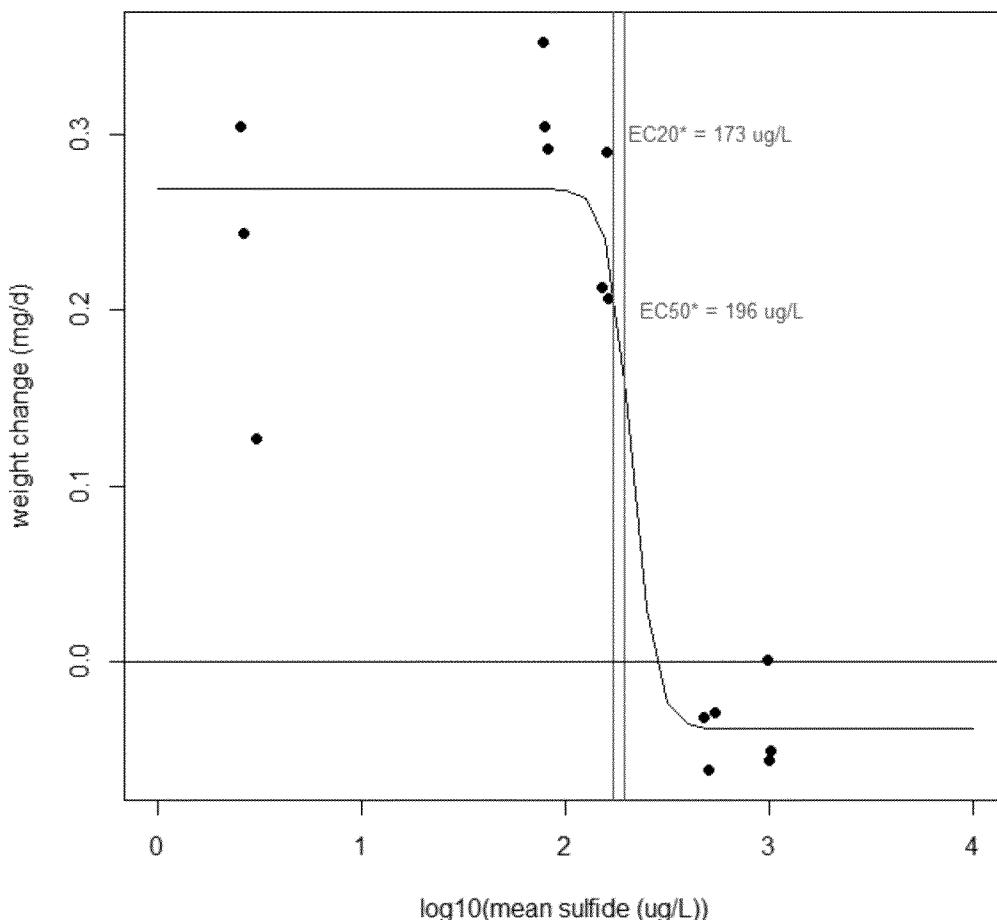
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Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 '' 1

Residual standard error: 0.05889 on 11 degrees of freedom

Number of iterations to convergence: 0

Achieved convergence tolerance: 5.639e-06

**Definitive 2**

**Model 4****Data set = Range Finder****Y = weight change****X = log(mean initial sulfide concentration)**

Formula: weight\_change\_mgd.1 ~ SSfpl(log\_meaninitialsulfide\_ugL, a, b,  
c, d)

Parameters:

Estimate	Std. Error	t value	Pr(> t )
a	0.48265	0.03612	13.364 3.82e-08 ***
b	-0.08572	0.05944	-1.442 0.1771
c	2.72890	0.09719	28.079 1.37e-11 ***
d	0.22054	0.07586	2.907 0.0143 *

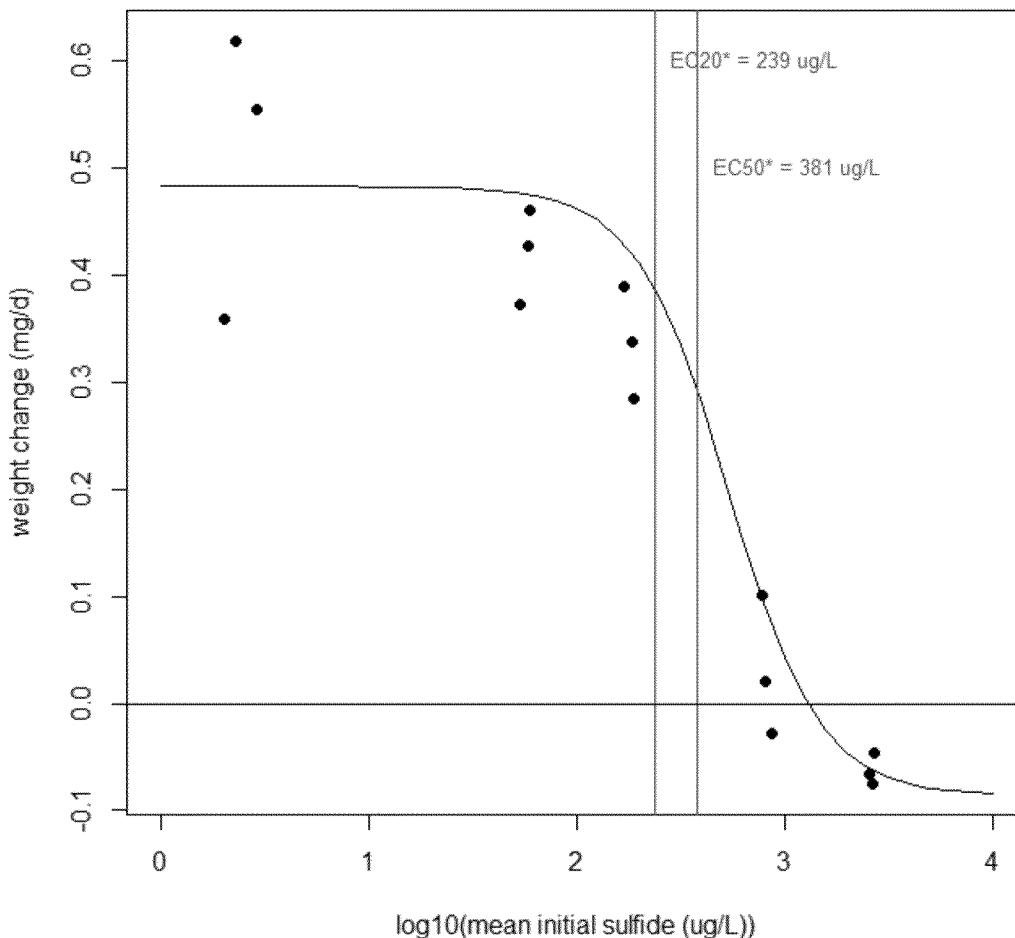
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Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 '' 1

Residual standard error: 0.07411 on 11 degrees of freedom

Number of iterations to convergence: 8

Achieved convergence tolerance: 7.537e-06

**Range Finder**

**Model 5****Data set = Definitive 1****Y = weight change****X = log(mean initial sulfide concentration)**

Formula: weight\_change\_mgd.1 ~ SSfpl(log\_meaninitialsulfide\_ugL, a, b,  
c, d)

Parameters:

Estimate	Std. Error	t value	Pr(> t )
a 0.41524	0.04717	8.804	2.60e-06 ***
b -0.21105	0.08016	-2.633	0.0233 *
c 2.62819	0.08731	30.102	6.43e-12 ***
d 0.16320	0.06513	2.506	0.0292 *

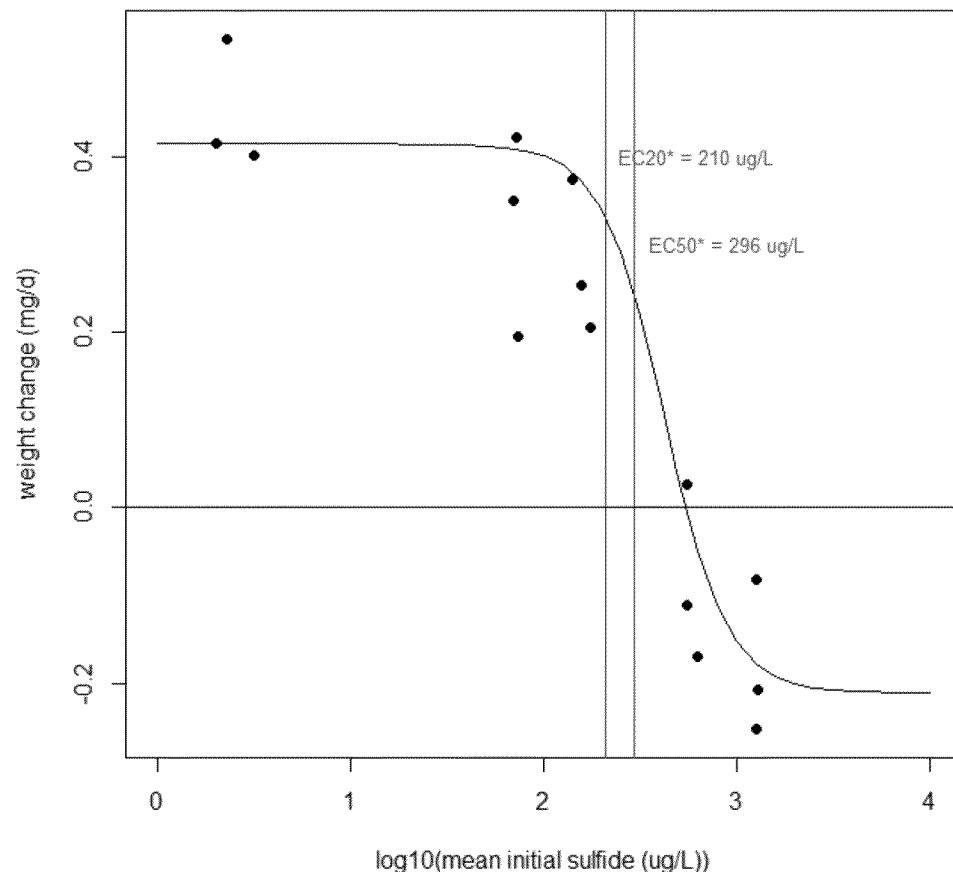
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Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 '' 1

Residual standard error: 0.09422 on 11 degrees of freedom

Number of iterations to convergence: 0

Achieved convergence tolerance: 5.564e-06

**Definitive 1**

**Model 6****Data set = Definitive 2****Y = weight change****X = log(mean initial sulfide concentration)**

Formula: weight\_change\_mgd.1 ~ SSfpl(log\_meaninitialsulfide\_ugL, a, b,  
c, d)

Parameters:

Estimate	Std. Error	t value	Pr(> t )
a 0.26937	0.02407	11.192	2.37e-07 ***
b -0.03867	0.03292	-1.175	0.265
c 2.57251	0.26466	9.720	9.81e-07 ***
d 0.04166	0.11854	0.351	0.732

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Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 '' 1

Residual standard error: 0.05907 on 11 degrees of freedom

Number of iterations to convergence: 21

Achieved convergence tolerance: 9.047e-06

**Definitive 2**